CARDIOVASCULAR DISEASE PREVALENCE AND PRESCRIPTION PATTERNS AT A TERTIARY LEVEL HOSPITAL

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The Tamil Nadu Dr. M.G.R. Medical University,

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In partial fulfillment of the award of the degree of

MASTER OF PHARMACY IN

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Submitted by

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EVALUATION CERTIFICATE

This is to certify that the dissertation work entitled **"Cardiovascular Disease Prevalence and Prescription Patterns at a Tertiary Level Hospital"** submitted by the student bearing **[REG.No.261540205]** to **"The Tamil Nadu Dr. M.G.R. Medical University"**, Chennai, in partial fulfillment for the award of Degree of **Master of Pharmacy** in **Pharmacy Practice** was evaluated by us during the examination held on.....

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CERTIFICATE

This is to certify that the work embodied in this dissertation en titled **"Cardiovascular Disease Prevalence and Prescription Patterns at a Tertiary Level Hospital",** submitted to "**The TamilNadu Dr.M.G.R. Medical University**", Chennai, in partial fulfillment to the requirement for the award of Degree of **Master of Pharmacy** in **Pharmacy Practice**, is a bonafide work carried out by **Ms. LEENAH ALMONSHATIH DIRAR ALI, [REG.No.261540205]** during the academic year 2016-2017, under the guidance and direct supervision of **Dr. N. Venkateswaramurthy. M.Pharm., Ph.D.,** Professor and Head, Department of Pharmacy practice, J.K.K.Nattraja College of Pharmacy, Kumarapalayam.

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DECLARATION

I do hereby declared that the dissertation **"Cardiovascular Disease Prevalence and Prescription Patterns at a Tertiary Level Hospital",** submitted to "**The Tamil Nadu Dr. M.G.R Medical University"**, Chennai, for the partial fulfillment of the degree of **Master of Pharmacy** in **Pharmacy Practice,** It is a bonafide research work has been carried out by me during the academic year 2016-2017, under the guidance and supervision of **Dr. N. Venkateswaramurthy, M.Pharm., Ph.D.,** Professor, Head, Department of Pharmacy practice, J.K.K. Nattraja College of Pharmacy, Kumarapalayam.

I further declare that this work is original and this dissertation has not been submitted previously for the award of any other degree, diploma , associateship and fellowship or any other similar title. The information furnished in this dissertation is genuine to the best of my knowledge.

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CONTENTS

INTRODUCTION

Cardiovascular disease (CVD) is a kind of diseases that deals with the heart or blood vessels.[1] Cardiovascular disease involves coronary artery diseases (CAD) such as angina and myocardial infarction (commonly certified as heart attack).[1] Other CVDs are stroke, hypertensive heart disease, rheumatic heart disease, cardiomyopathy, heart arrhythmia, congenital heart disease, aortic aneurysms, peripheral artery disease, valvular heart disease and venous thrombosis.[1],[2] Globally cardiovascular diseases are the major and main cause of death.[1] In 2013 17.3 million deaths (31.5%) were cropped up from 12.3 million (25.8%) in 1990.[2] Deaths from Cardiovascular disease at a given age are more habitual and have been expanding in much of the developing world, while rates have been dropped in developing countries since the 1970s.[3],[4] 80% of Cardiovascular disease deaths in male and 75% in female were scored for stroke and Coronary artery disease.[1] Most CVD's affects older adults.

11% of people in US in the age of 20 to 40 having CVD, while in the range of 40 to 60 years are 37% of people, 71% of citizens between 60 and 80 have CVD, and people over 80 are 85%.[5]In the developed world the approximate age of death from coronary artery disease is around 80 while it is around 68 in the developing countries.[4] Disease access is commonly 7 to 10 years earlier in men than women.[6]

EPIDEMIOLOGY:

CVDs are the headmost cause of death. In 2008, 30% of all worldwide deaths is indicated to cardiovascular diseases.

Death aimed by CVD's are also greater in low as well as middle-income countries as over 80% of loss of life caused by cardiovascular diseases globally occurred in those countries. It is also predicted that, over 23 million people will be expired from cardiovascular diseases each year by 2030. Approximately 60% of the burden of cardiovascular disease in the world will occur in the South Asian subcontinent even though they make up 20% of the world's population. This may be the result of a combination of environment and genetic predisposition factors.

Organizations such as the Indian Heart Association are working with the World Heart Federation to raise awareness about this issue.[7]

TYPES:

There are numerous cardiovascular diseases involving the blood vessels. They are known as vascular diseases:

- Coronary artery disease (also known as coronary heart disease and ischemic heart disease).
- Peripheral arterial disease – disease of blood vessels that provide blood to the legs and arms.
- Cerebrovascular disease – disease of blood vessels that provide blood to the brain (includes stroke).
- Renal artery stenosis.
- Aortic aneurysm.

There are also various cardiovascular diseases that concern the heart.

- Cardiomyopathy – diseases of cardiac muscle.
- Hypertensive heart disease – diseases of the heart along with high blood pressure or hypertension.
- Heart failure.
- Pulmonary heart disease – a failure at the right side of the heart secondary to respiratory system involvement.
- Cardiac dysrhythmias – irregular heart rhythm Inflammatory heart disease.
- Endocarditis – inflammation of the inner layer of the heart, the endocardium. The most commonly involved structures are the heart valves.
- Inflammatory cardiomegaly.

- Myocarditis – inflammation of the myocardium, the muscle of the heart.
- Valvular heart disease.
- Congenital heart disease – heart composition malformations existing at birth.
- Rheumatic heart disease –valves and heart muscles destroyed due to rheumatic fever caused by Streptococcus pyogenes a group A streptococcal infection.[8]

RISK FACTORS:

There are several risk factors for heart diseases: age, sex, tobacco use, excessive alcohol consumption, physical inactivity, unhealthy diet, obesity, family history of cardiovascular disease, elevation of blood pressure (hypertension), elevated blood sugar (diabetes mellitus), hyperlipidemia (high blood cholesterol), poverty and low educational status, psychosocial factors and air pollution.[9],[10],[11],[12],[13] The individual contribution of these risk factors varies between different communities or ethnic groups while the overall contribution of each risk factor is very consistent .[14] Some of these risk factors, like sex, age or family history, genetic, are immutable; while other cardiovascular risk factors are adapted by social change, lifestyle change, drug treatment and prevention of hypertension, hyperlipidemia, and diabetes.

❖ **Modifiable risk factors:**

➢ **Hypertension:**

Hypertension is the major hugest risk factor for stroke. It also undergoes an important role in heart attacks. It may be arrested and successfully cured but only if it has been diagnosed and stick to your recommended management plan.[15]

➢ **Cholesterol:**

Deviation of lipid levels in blood, known as high total cholesterol, elevation of triglycerides levels, high levels of low-density lipoprotein or low levels of high density lipoprotein (HDL) cholesterol all enlarged the heart disease and stroke

risks. Following a healthy diet, exercise and medication can improve your blood lipid profile.[15]

- **Diabetes:**

Type 2 diabetes an extreme coronary heart disease and stroke risks factor. Having diabetes doubles the likelihood of somebody who does not to develop cardiovascular disease. Developing cardiovascular disease at an earlier age than other people will be more likely, diabetes is not controlled and it will be more devastating. Diabetes emit out the protective effect of estrogen in per-menopausal women and heart disease risks rises significantly.[15]

- **Tobacco:**

Tobacco: Using tobacco either by smoking or chewing to, improve risks of cardiovascular disease. The risk is increased especially if smoking started at young age, smoking heavily or was in woman. On other hand passive smoking is another risk factor for cardiovascular disease. Avoiding tobacco may decrease risk of cardiovascular disease.[15]

- **Diet:**

Low dietary consumption of fruits, vegetables, fish, high consumption of salt, saturated fat and trans-fats are linked to cardiovascular risk. It has been characterized by the World Health Organization that around 1.7 million deaths worldwide due to low fruit and vegetable consumption.[1] It is an important determinant of blood pressure levels and overall cardiovascular risk to measure the quantity of consumed dietary salt.[1] Frequent intake of high-calorie foods, such as processed foods that are high in sugars and fats, cause obesity and may improve cardiovascular risk.[1] High trans-fat intake has adverse effects on blood lipids and circulating inflammatory signs,[16] and trans-fat rejection across the border of diets has been widely advocated.[17] There is a fact that greater consumption of sugar is coupled with higher blood pressure and critical blood lipids,[18] and intake of sugar also augments the risk of diabetes mellitus.[19]

Great intake of processed meats is linked with elevation of cardiovascular disease risks, perhaps due to increased dietary salt intake.[20]

- **Alcohol consumption:**

The relationship between cardiovascular disease and alcohol consumption is multifaceted, and can depend on the quantity of alcohol consumed. There is a direct correlation between cardiovascular disease risks and high levels of alcohol consumption.[1] Drinking at low levels without incidence of heavy drinking may be linked with decreasing risk of cardiovascular disease.[21] Generally, alcohol consumption is linked with the level of population with multiple health risks that go beyond any potential benefits.[1],[22]

- **Physical inactivity:**

Lack of physical activity (defined as below 5 x 30 minutes of normal activity per week, or below 3 x 20 minutes of vigorous activity per week) is the fourth risk factor of death worldwide.[1] In 2008, around 31.3% of adults aged 15 or above (28.2% men and 34.4% women) were inadequate physically active.[1] The ischemic heart disease and diabetes mellitus risk is decreased by almost a third in adults who join in 150 minutes of moderate physical activity each week (or equivalent).[23] Apart from that, physical activity collaborates loss of weight and emends blood pressure, lipid profile, blood glucose control and insulin sensitivity. These effects may partially explain its cardiovascular benefits.[1]

- **Socioeconomic disadvantage:**

Cardiovascular disease influence in high-income countries less than low and middle-income countries.[24] There is comparatively little information about social patterns of cardiovascular disease within low- and middle-income countries,[24] but within high-income countries low educational status low income are typically linked with superior risk of cardiovascular disease.[25] The policies which resulted in increased socio-economic inequalities accompanied by greater socio-economic differences in cardiovascular disease[24] later on resulting in a domino effect relationship. Psychosocial considerations, environmental

exhibitions, health behaviors, and health-care, quality contribute and access to socio-economic differentials in cardiovascular disease.[26] The Commission on Social Determinants of Health recommended that more equal distributions of power, wealth, education, housing, environmental factors, nutrition, and health care were required to address inequalities in cardiovascular disease and non-communicable diseases.[27]

- **Medications:**

Risk of heart disease may be elevated by medicines like contraceptive pill and hormone replacement therapy (HRT).[15]

- **Non modifiable risk factors:**

- **Genetics:**

Cardiovascular disease in a person's parents increases their risk by 3 fold.[28]

- **Age:**

Age, so far is the most critical risk factor with approximately a tripling of risk with each decade of life in developing cardiovascular or heart diseases.[29] Coronary fatty streaks can start to form in adolescence.[30] It is considered that 82 percent of citizens who die of coronary heart disease are 65 and older.[31] In the meanwhile, after age 55 the risk of stroke doubles every decade.[32] Several explanations have been proposed to clarify why age elevates the risk of cardiovascular/heart diseases such as serum cholesterol level.[33] In most individuals, the serum total cholesterol level elevates as age augments. In men, around the age 45 to 50 years this levels increases.

In women, the increase continues sharply until age 60 to 65 years.[33] Aging is also collaborate with changes in the structural and mechanical properties of the vascular wall, which results in decreased arterial compliance and loss of arterial elasticity and may eventually cause coronary artery disease.[34]

- **Sex:**

Male are at greater risk of heart disease than pre-menopausal female.[29][15] When exceeding menopause, it has been suggested that a female's risk is similar to a male's[15] recently facts from the World Health Organization and United Nation disputes this.[29] Diabetes in female make them more likely to promote heart disease than a male with diabetes.[35] Coronary heart diseases are more familiar among middle-aged men two to five times than women.[33] In a research done by WHO, gender contributes to nearly 40% of the variation in sex ratios of coronary heart disease mortality.[36] Another study concludes similar results finding that gender diversities explains almost half of the risk related to cardiovascular diseases[33] hormonal difference is one of the projected clarifications for sex differences in cardiovascular diseases.[33] By the whole of women, estrogen is the absolute sex hormone.

Estrogen may have guarding property through glucose metabolism and haemostatic system, and may have direct effect in promoting endothelial cell function.[33] The creation of estrogen diminishes after menopause, and this may alter the female lipid metabolism to more atherogenic form by reducing the HDL cholesterol level while increasing total cholesterol and LDL levels.[33] There are notable differences in height, body weight, heart rate, body fat distribution, arterial compliance and stroke volume among male and female.[34] At a very early age, pulsatility and hardening of arteries significantly associated with age is more obvious among female than male.[34] This might be due to the women's smaller body size and arterial dimensions which are independent of menopause.[34]

- **Ethnicity:**

Your ethnic origin plays a role. Asian or African origin are at higher risks of creating cardiovascular disease than other racial groups.[15]

TREATMENTS:

There are various classes of medications prescribed for heart disease patients. It's

essential for both care givers and patients suffered from heart disease to understand the prescribed medication, to follow the directions of usage, and to be capable to know the obtainable side effects associated with the medicine. The most common prescribed drugs for heart disease include:[37]

❖ ANGIOTENSIN CONVERTING ENZYME(ACE) INHIBITORS:

Angiotensin is a hormone that forces the blood vessels to narrow or get smaller. This increases individual's blood pressure. By decreasing the level of angiotensin, blood vessels enlarge. Blood flows easier through the enlarged blood vessels and blood pressure are reduced. A doctor would prescribe an ACE inhibitor for people with hypertension or heart failure because the heart doesn't draft sufficient blood to fit the body's demands.[38] They also block fragment of the harmful procedures of the endocrine system that might occur with heart failure.[37] These medications are also vital post-heart attack. This is because they can help prevent a future event and they also help to recover the heart muscle from the insufficiency of oxygen during the heart attack.[38]Examples for commonly prescribed drugs includes:

- Benazepril. - Captopril. - Enalapril.
- Fosinopril. - Lisinopril. - Moexipril.
- Perindopril. - Quinapril. - Ramipril.
- Trandolapril.[39]

❖ ANGIOTENSIN-II RECEPTOR BLOCKERS (ARB):

Unlike angiotensin converting enzyme inhibitors, angiotensin receptor blockers completely block the effects of angiotensin II on the heart. This effect lowers blood pressure. Doctors prescribe this medication to CHF patients and patients with hypertension. Angiotensin receptor blockers and angiotensin converting enzyme inhibitors have related functions and purposes. Studies have shown ACE inhibitors may slow kidney disease improvement in type 1 diabetes and kidney disease patients. ARBs may slow kidney disease improvement in type 2 diabetes and kidney disease patients.[40] Examples for frequently prescribed drugs

includes:

-Candesartan - Eprosartan - Irbesartan

-Losartan - Telmisartan - Valsartan[39]

❖ **ANTICOAGULANTS (BLOOD THINNERS):**

Plaque is a primary problems in coronary artery disease. Sometimes it can cause blood clots. Clot partially or completely prevent blood from flowing anywhere past the clot, when the clot lodged in a heart vessel. Any heart muscle that relied on that vessel for nutrients and oxygen will die if blood flow is not build up very quickly. A potentially fatal pulmonary embolism can result, when blood clot moves to the lungs. Stroke could occur, when a clot lodges in the brain. Anticoagulants can block blood clots from forming but don't break up existing blood clots.[41] Examples for frequent prescribed drugs includes:

-Rivaroxaban - Dabigatran - Apixaban

- Heparin - Warfarin[39]

❖ **ANTIPLATELETS:**

Antiplatelet medications are prescribed after a cardiac event like a heart attack. Doctors also prescribe them for people with known plaque developed in their arteries to prevent heart attacks. People who experience abnormal heart rhythms, such like atrial fibrillation may also take antiplatelets because they are at increased risk for blood clots.[41]Examples for frequent prescribed drugs includes:

- Aspirin - Clopidogrel -Dipyridamole

-Prasugrel - Ticagrelor[39]

❖ **BETA BLOCKERS:**

Beta-blockers block the effects of adrenaline (epinephrine) and thereby enhance the heart's ability to perform. They also decrease the production of harmful substances creates by the body in response to heart failure. They cause the heart

pulse rate to be more gently with quite force, lowering blood pressure.[37] Examples for frequent prescribed drugs includes:

- Acebutolol - Atenolol - Bisoprolol

- BetaxololBisoprolol/hydrochlorothiazide

- Metoprolol - Nadolol - Propranolol

- Sotalol[39]

❖ **CALCIUM CHANNEL BLOCKERS (CCB):**

Calcium channel blockers can work on different regions of the body to serve specific purposes based on a person's unique health condition or conditions. Calcium has several effects on the body such as trigger heart contractions. By reducing calcium's rate in triggering these contractions, blood vessels can relax. Blood pressure then lowers. Doctors prescribe CCBs for hypertension, heart arrhythmias and chest pain patients.[41]Examples for frequent prescribed drugs includes:

- Amlodipine - Diltiazem - Felodipine

- Nifedipine - Nimodipine - Nisoldipine

- Verapamil[39]

❖ **CHOLESTEROL LOWERING MEDICATION:**

Cholesterol formed in the blood vessels may cause plaque to build up, narrowing blood vessels. The plaque can break off and block the blood vessel if a blood clot forms around the plaque rupture. Examples of cholesterol-lowering medications include the following. It has been proven that some of these drugs decrease the risk of death from CAD:

- **Statins:** Atorvastatin, Pravastatin sodium and Simvastatin.
- **Bile acid resins:** Cholestyramine

- **Cholesterol absorption inhibitors:** Ezetimibe
- **Fibric acid derivatives:** Fenofibrate
- **Nicotinic acid:** Niacin[41]

❖ **VASODILATORS:**

Vasodilators prescribed to cure heart failure and manage elevated blood pressure by comforting the blood vessels so blood can flow smoothly through the body. Vasodilators are selected for patients who cannot take ACE inhibitors.[37] Examples for frequent prescribed drugs includes:

-Isosorbidedinitrate - Nesiritide -Hydralazine

-Nitrates - Minoxidil

❖ **DIURETICS:**

Diuretics, generally known as "water pills," allow the kidneys to get rid of unneeded salt and water from the bloodstream and tissues into the urine. Getting rid of plenty of fluid makes it simple for your heart to pump. Diuretics are prescribed to treat elevated blood pressure and reduce the swelling and water build-up caused by various medical problems, including heart failure. They also helps make breathing easier.[37] Examples for frequent prescribed drugs includes:

- Amiloride - Bumetanide - Chlorothiazide

-Chlorthalidone - Furosemide - Hydrochlorothiazide

-Indapamide - Spironolactone [39]

DRUD PRESCRIPTION PATTERN:

Prescribing pattern are a reflection of the ability of health professionals to distinguish among the various choices of drugs and determine the ones that will most benefit their patients.[42] Prescription writing is an art and science, as it forwards the message from the physician to the patient. Prescription order is an

important harmony among the physician and the patient. It is an order for a scientific medication for a member at a particular time.[43]It brings in to focus on discerning diagnosis and therapeutic efficiency for the physician with instructions for softening or restoration of the patient's health.[44] The study of prescribing patterns described a part of medical review and seeks to monitor, evaluate if necessary, propose amendments in prescribing practices to make medical care rational and cost effective.[45] Apposite drug utilization studies are essential means to review whether drugs are utilized accurately in terms of effectiveness, security, expediency and financial aspects at all stages in the series of drug use.[46]

DRUG UTILIZATION:

Drug utilization research is an important branch of pharmacoepidemiology as it elucidate the scope, character and determinants of drug exposure.[47]the world health organization (WHO)in 1997 defined drug utilization as the prescribing, allotment, marketing and use of drugs in a civilization , among a particular focus on the medical, social, and economic consequence resulted.[48] Drug use is a complex process. In any country a large number of socio-cultural factors assign to the manner in which drugs are used. In India, these includes national drug policy, illiteracy, poverty, use of multiple health care systems, drug marketing and promotion, sale of prescription drugs without prescription, competition in the medical and pharmaceutical market place and limited availability of independent, unbiased drug information. The complexity of use of drug means the optimal profits of drug therapy in patient care may not be attained because of underuse, overuse or abuse of drugs. Unfortunate drug use might also cause to elevate rate of medical concerns, antimicrobial resistance, adverse effects and patient mortality.[49] Hence contemporary studies on drug utilization have developed into a probable mean to be used in the assessment of health systems.[50]The awareness of drug utilization studies starts in the early 1960s. [51,52] and its importance has elevated since then because of augmentation in marketing of new drugs, deep distinction in the pattern of drug prescribing and utilization, rising concern about delayed adverse events and the mounting concern regarding the charge of drugs.[53,54,55,56]

TYPES OF DRUG UTILIZATION STUDIES:

Drug Utilization studies are moreover Qualitative or Quantitative [49]

- **Qualitative** Drug Utilization studies are multidisciplinary process which collect, organize, analyze and report information an actual drug use. They usually examine use of precise drugs or specific conditions.

- **Quantitative** Drug Utilization studies involve the collection, organization, and demonstration of estimates or measurements of drug use. This information is generally used for making purchase decisions or preparing drug budgets. However statistics from quantitative drug utilization studies are generally considered suggestive, indefinite with respects to quality of drug use.

SCOPE OF DRUG UTILIZATION EVALUATION:

Drug use evaluation (DUE) or DU studies is a continuous, official and logical quality improvement method, which is considered to:

- Study drug utilization and/or prescribing patterns.
- Distribute criticism of results to clinicians.
- Build up standards and criteria which illustrate optimal drug use.
- Maintain proper drug utilization through education and other interventions.[49]
- They supply feedback of drug use data to prescribers.
- They attach the number of patients exposed to the number of cases of adverse effects. They assess drug at a population level, according to age, sex, social, class. They include concept of appropriateness that must be assessed relative to the indication for the treatment, concomitant diseases and the utilization of other drugs.

Thus DUE plays a main role in helping the healthcare system to recognize, understand and develop the prescribing, administration and use of medications.[57,58]

SOURCES OF DATA ON DRUG UTILIZATION:

- Large database. [47,59]
- Data from drug authoritarian agencies.[60]
- Supplier (distribution) data.[61,62]
- Practice setting data.[63]
  - Prescribing data.
  - Dispensing data.
  - Aggregate data.
  - Over- the- counter and pharmacist – prescribed drugs.
- Community setting data.
- Drug use evaluation.[64]

BENEFITS OF DRUG UTILIZATION:

The main principal of DU research is to promote the coherent use of drugs in individuals. For the individual patient, the coherent use of a drug indicates the prescription of a well recognized drug at an ideal dose, along with the accurate information, at an standard price. Without knowledge of the manner of prescribing a drug and it use, it is stiff to initiate a discussion on rational drug use or to commend measures to promote prescribing habits. DU research affords to rational drug use in important ways as described below.

❖ DISCRIPTION OF DRUG USE PATTERNS:

DU research can improve our knowledge in how drugs are used as below.

- It might be used to determine the numbers of patients disclosed to specific drugs within a period.

- It can explain the extent of use at an absolute moment and/or in a satisfied area (e.g. in a country, region, community or hospital).
- It can distinguish the prototype or contour of drug use and the scope to which substitute drugs are used to cure particular conditions.
- It may be used to analyze the observed prototype of drug use for the healing of a certain disease with current guidelines.

❖ EARLY SIGNALS OF IRRATIONAL USE OF DRUGS:

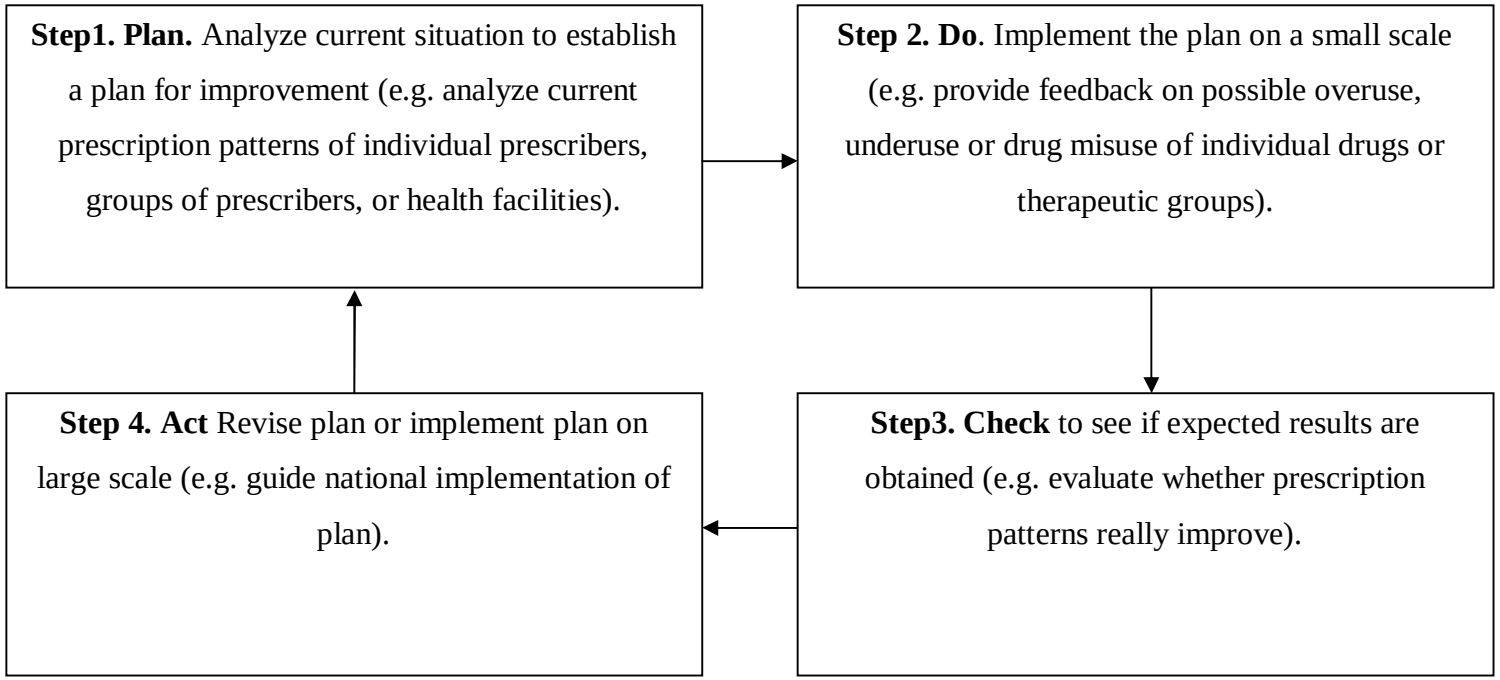
DU research might create hypotheses that set the agenda for further investigations, and thus prevent prolonged illogical use of drugs.

❖ INTERVENTIONS TO IMPROVE DRUG USE:

DU research allows us to evaluate whether interventions intended to enhance drug use have had the ambition impact.

❖ QUALITY CONTROL OF DRUG USE:

Drug use supposed to be managed according to a quality control cycle that offers a systematic framework for continuous quality improvement.[65]


Step1. Plan. Analyze current situation to establish a plan for improvement (e.g. analyze current prescription patterns of individual prescribers, groups of prescribers, or health facilities).
Step 2. Do. Implement the plan on a small scale (e.g. provide feedback on possible overuse, underuse or drug misuse of individual drugs or therapeutic groups).
Step3. Check to see if expected results are obtained (e.g. evaluate whether prescription patterns really improve).
Step 4. Act Revise plan or implement plan on large scale (e.g. guide national implementation of plan).

LITRATURE REVIEW

Steven E. Reis [66] *et al.*, (1997) conducted a study on practice patterns and outcome for the treatment of congestive heart failure. This study sought to define specialty- related difference in the care and outcome of patients admitted to the hospital with congestive heart failure. The study included patients admitted to university teaching hospital in US who had been cared by a generalist (n=160) and those whose care was guided by a cardiologist (n=138) in a period of 6 months. Subject of >50% of patients admitted to the hospital with CHF cared for by generalists alone had minimal symptoms compared with <15% of those cared for by cardiologist ($p < 0.01$). the various drugs used frequently were divided into 3stages, pre-hospital, in hospital and while discharge. In pre-hospital and discharge stage ACE-I, Digoxin, Diuretics and Nitrates were prescribed. In hospital IV diuretic therapy, IV inotropic therapy and IV vassopressor therapy were used. It was concluded that involvement of cardiologist in the care of patients admitted to the hospital with CHF is associated with increased use of diagnostic testing, longer hospital stays and improved clinical outcome. These results substantiate practice guidelines that suggest a role for cardiologists in the care of symptomatic patients with CHF.

Mitu Baskota [67] *et al.*, (2006) conducted a study on the prescribing patterns on drugs used in heart failure. The prevalence of heart failure in south Asian Origin including Nepal increases with the age and accounts for most of the adult hospital admissions. The study included both the in-patients and outpatients conducted at 2 different hospitals inside the Kathmandu valley and one outside the valley, Dhulikhel. The period of the study was around 4 months and the number of patients included was 156, which included total of 71 males (52.59%) and 64 females (47.4%). Subjects of age groups 45-65 (45%) were found to be more susceptible to heart failure. Significant age, smoking & alcohol use, associated disease, family history of disease related factors in the prevalence of heart failure were seen. The various drugs used frequently were, Diuretics, Cardiac glycosides, ACE-I, A II Receptor blockers and Anti-Coagulants. In the combination of drugs ACE-I+ Diuretics+ Digoxin was used most frequently. ACE-I was not appropriately prescribed as per the literature facts that they various benefits in the

treatment of Congestive Heart Failure and hence was underused. Ramipril, Lisinopril were also considered in the prescriptions in spite of their new entries. ARB though similar in properties to the ACE accounts for a very small proportion of drug use profile, where high cost and lower availability may be accounted. Beta- blockers were also prescribed extensively.

CA Richter[68] *et al.*, (2009) conducted a study on practice pattern and outcomes in patients presenting to the emergency department with acute heart failure. This study sought to describe current treatment patterns of patients presented to the emergency department (ED) with acute HF and investigate whether these treatments influenced outcomes. A health record review was performed in a 30% random sample of all patients who presented to 6 ED in the Capital Health Region (Edmonton, Alberta) with a most responsible diagnosis of acute HF from April 2002 to March 2003. A total of 448 patients (45% women) with a mean (± SD) age of 75.3± 11.2 years were included. Co-morbidities included hypertension (55%), coronary artery disease (39%), and previous myocardial infarction (38%). In the first 72 h, patients were commonly treated with IV furosemide (48%), ACE-I or ARB (45%), oral furosemide (42%) and salbutamol (38%). 45% of patients were admitted to the hospital, and 20% died or were readmitted within 30 days. Multivariate logistic regression analysis revealed age, history of HF, history of angioplasty and oxygen administration in the ED as independent predictors of death or readmission at 30 days. No medicines were associated with decreased readmission or death. It was concluded hate current treatment patterns for acute HF mostly symptomatic. Proven efficacious HF therapies remain underused. Future research should focus on the integration of disease management, identifying predictors of admission and readmission, and treatments to reduce re-hospitalization.

Tasneem Sandozi [69] *et al.*, (2010) conducted a study on drug utilization for ischemic heart disease associated with diabetes and hypertension. The study sought to evaluate drug utilization in acute coronary syndrome associated with diabetes and hypertension in a tertiary care hospital in Hyderabad, India. It was a retrospective study done for a period of 3 months during which treatment of 140 patients was studied, 96 of these were male and 44 were female. The average age

of male was 62 years (range 36-63 years) while for female was 61 years (range 30-80 years). The average number of drugs prescribed per patient was 9.93 which is states that the incidence of poly-pharmacy was high. Trade names were used more frequently when compared to generic names. If only generic names are used it can decrease the financial burden of the patient. The most frequent drugs prescribed were Beta Blockers (Metoprolol), Calcium Channel Blockers (Amlodipine), ACE-I (Captopril), Lipid Lowering Agents (Atorvastatin), Anticoagulants (Unfractionated heparin) and Antiplatelet drugs (Aspirin and Clopidogrel combination).the value of long term use of clopidogrel along with aspirin was substantial, making this drug a valuable addition to the effective medication for secondary prevention of high risk patients.

MD. Abdul Muhit[70]*et al.*, (2012) conducted a study on cardiovascular diseases prevalence and prescription pattern in a tertiary care hospital in Bangladesh. A cross- sectional type descriptive study was carried out at the outdoor of National Institute of Cardiovascular Diseases (NICVD), Dhaka from July'09 to August' 09. A total of 780 patients, who acquire with the inclusion and exclusion criteria, were interviewed with structured questionnaire and followed up by prescription monitoring. Out of the total patients with a male, female ratio of 5.3:4.7, 45.90% patients were over 55 years and 69.62% patients had come from urban area. The patients had lipid level disorder (47.05%), hypertension (28.05%), heart failure (27.25%), ischaematic heart disease (21.55%) and 40.39% were associated with diabetes. Individual patients got 6.35± 1.56 number of drug of different class of which most frequently prescribed were antiatherogenic (97.67%), lipid lowering agents (95.35%), antianginal (79.07%), beta- blockers (51.16%), ACE inhibitors (30.23%), diuretics (37.21%), anxiolytics (81.4%)etc. The data may be proportion for the general physicians for optimizing rational use of cardiovascular drugs and also accessible in formulating strategy for effective CVD management.

Popuri Rupa Sindhu[71] *et al.*, (2013) conducted a study on prescriptive patterns of antihypertensive drugs in south India super-specialty hospital. This prospective study was carried out in a period of 4 months from a series of 205 patients of either sex by scrutinizing the outpatient cards and laboratory reports of

inpatients attending the hospital. The data collected were analyzed for prescribing patterns of antihypertensive drugs and demographic profiles of the patients suffering from hypertension. The results were analyzes and tabulated statistically by student's t test. P value <0.05 is considered. The study revealed that calcium channel blockers were the drug of choice for hypertensive patients as a single drug therapy and overall utilization. Utilization of diuretics in the study was 5.1% as mono therapy which is lesser even though they are available at lower cost. The study showed that a higher percentage of patients (56.09%) were found to be on dual therapy and among them 73 (63.4%) were found to be treated with fixed dose combination i.e. ARB + Diuretics followed by beta blockers + CCBs and the reduction of SBP and DBP was found to be significant with these combinations and the pattern is according to JNC guidelines. The study revealed that the prescription of antihypertensive medication is according to JNC guidelines except mono therapy of diuretics.

A. Sivakumar[72] *et al.*, (2014) conducted a study on prescription pattern of anti- hypertensive's in a tertiary care hospital. In a prospective study of 9 months duration prescriptions containing anti-hypertensive's were collected from the patients attending the outpatient department of general medicines. Pregnant women were excluded from the study. The patients demographics, blood pressure, anti-hypertensive drugs prescribed were entered in a specially designed Performa. A total of 310 prescriptions were monitored, of which 188 were male and 122 were female. The age groups vary from 21 to 70 years. Among 310 hypertensive's, 58.38% of patients were treated with dual combinations, 30.64% of patients were treated with single anti-hypertensive drug and 10.96% of patients were treated with triple drug combinations. In monotherapy, ARB (Telmisartan) were most commonly prescribed (n=21). In combination therapy, a two drug combination consisting of ARB (Telmisartan) and diuretics (hydrochlorothiazide) were given to the majority of patients (n=40; 12-90%). In the triple drug therapy ARB (Telmisartan), diuretics (hydrochlorothiazide) and calcium channel blockers (Amlodipine) are the highest prescription(8.06%) for the patients. The study conclude that, ARBs were the most used anti-hypertensive agents especially Telmisartan. ACEIs were the least prescribed anti-hypertensive agent. Double and

triple combination therapies are more used when compared to monotherapy. In combination ARB and Diuretics (16.23%) were placing the first place in prescription and followed by ARB and CCB (12.73%). The least combination was Beta Blockers with Diuretics (1.93%).

Shruti Dawalji[73] *et al.*, (2014) conducted a prospective, observational study on prescribing pattern in coronary artery disease in the department of cardiology at Global Hospital, Hyderabad in a period of 9 months duration. Pattern of different drugs prescribed in coronary artery disease were analyzed. 170 patients were included in the study. Out of these, 124 (72.94%) were male and 46 (27.06%) were female patients. Most of the patients diagnosed with coronary artery disease were of the age group of 46-66 (72.36%). The most common co-morbid conditions were hypertension in 110 (64.71%) and diabetes in 66 (38.82%) patients. The prescription pattern of various cardiovascular drugs were found to be as anti-platelet drugs 169 (99.41%), anti-hyperlipidemic drugs 162 (95.29%), antibiotics 158 (92.94%), anti-anginal drugs 137 (80.59%), anti-hypertensives 110 (64.71%), anti-coagulants 110 (64.71%), diuretics 106 (62.35%) and bronchodilators 31 (18.24%). The average number of drugs per prescription was found to be 9.68 and the percentage of drugs prescribed by generic name was found as 1.76%. The percentage of encounters with an antibiotic prescribed was 92.94%. The most commonly prescribed drug classes in coronary artery disease were anti-platelet drugs followed by anti-hyperlipidemic and antibiotics. This was followed by anti-anginal drugs, anti-hypertensives and anti-coagulants. Poly-pharmacy (9.68 drugs per prescription) was noticed. Very few drugs were prescribed by generic name. the prescribing pattern could be improved by reducing the number of drugs per prescription and by prescribing generic drugs to reduce economic burden of the patients.

Nikhat Tabassum[74] *et al.*, (2014) conducted a prospective study on drug utilization evaluation of cardiovascular drugs to understand the pattern occurrence of the various cardiovascular diseases and bring awareness about the rational use of drugs. Total 100 patients suffering from different types of cardiovascular diseases were included in the study within a time period of 6 months. As per the data collected from the case sheets of 100 patients it can be concluded that average

prevalence of cardiovascular diseases were found to be more in males than in females. Among the various CVD high prevalence was found to be of hypertension. Common age group of CVD was observed as 40-60 years. It was concluded that the drugs used for the treatment of cardiac disease are almost found to be rational. Rational use of drugs minimizes poly-pharmacy, drug interactions and in turn it minimizes the hospital stay. The drugs prescribed were from national list of essential medicines. The prescribing habits, route of administration, dosage forms were found to be appropriate.

Anand R. Kalamdani[75] *et al.*, (2014) handled a prospective study of prescribing pattern of anti-hypertensive drugs in tertiary care hospital in Bangalore. This drug utilization study was intended to find out the preferred drug group prescribed either alone or in combination and their adherence to the JNC7 guidelines. Furthermore the prescription variations as regards to the age, and concomitant illness were also analyzed. Drug utilization data were analyzed after getting the patients particulars regarding age, sex, drugs, concomitant illness etc. in the Performa. After analysis it was found that most frequently prescribed anti-hypertensive drugs were ARBs (58%), CCBs (50%), Beta blockers (15%), Diuretics (14%). 68% received mono-therapy while remaining 32% received combination therapy. It was concluded that the prescription pattern was found to be partly in accordance with JNC VII guidelines.

Zafar F[76] *et al.*, (2015) conducted a descriptive study on drug utilization pattern in cardiovascular diseases in tertiary care hospital in Pakistan in a time period of 3 months. This study intended to determine the drug utilization pattern in CVDs. Data collected from 100 patients having different age groups and it was assessed to determine the prescribing trends. Results indicated that hypertension and ischemic heart disease were mostly diagnosed and mostly diseases were treated by giving the drugs in combinations. The use of Beta blockers, Diuretics, CCBs, and ACE-I was very common. Also prescribing errors related to dosing frequency and prescribed dose were also determined.

Bharath Kumar D[77] *et al.*, (2015) carried out a retrospective study on drug utilization pattern in patients with congestive cardiac failure in a south Indian tertiary care hospital in a time period of 1 year. The study attempted to analyze the drug utilization pattern in CCF patients. A total of 100 prescriptions were analyzed from medical records of patients admitted to cardiology department with CCF. There were 68 male patients and 32 female patients. Most of the patients 83 (83%) affected with CCF were above 50 years. Hypertension 43 (25.1462%) was the most common co-morbidity seen with CCF. Diuretics 166 (29.80251%) were the most common class of drugs used to treat CCF. Under inotropic drugs, Digoxin 79 (32.6443%) was used in majority of CCF patients as evident from study. The study showed that poly-pharmacy 96 (96%) was preferred than mono-therapy 4 (4%) in CCF patients. The most common route preferred was Oral route720 (72.28916%) than 276 (27.71084%) intravenous route.

Mukesh Kumar[78] *et al.*, (2016) conducted a study on cardiovascular disease prevalence and drug utilization patterns at a tertiary care hospital in northeastern India in a time period of 3 months. 112 patients fulfilled the inclusion criteria were included to the study. Case papers were analyzed and documented for demographic variables, indications, disease prevalence, co-morbidities and prescribing pattern of the physician. It resulted that patients of age 61-90 y (48.21%) were diagnosed of CVDs. Male patients (67%) were diagnosed CVDs more than female patients (33%). It was indicated that hyperlipidemia (84.82%), hypertension (80.35%), and ischemic heart disease (66.96%) were most frequently diagnosed diseases and most of the diseases were treated by the combination of two or three drugs. The use of statins, beta blockers, diuretics, calcium channel blockers and AEC-I was very common. Diabetes, anemia and asthma were the co-morbidities associated with CVDs.

Bandla Aswani[79] *et al.*, (2016) carried out a prospective observational study on prescribing pattern of cardiovascular drugs and potential drug –drug interactions in an inpatient cardiology unit of a cardiac care hospital at Tirupathi, India in a time period of 6 months during regular ward rounds. The demographic details and treatment data of the 180 patients were collected in a specially designed Performa. The average age of study population was found to be 59.06 ±

1.8 years. Subjects of age groups > 40 (92.77%) were found to be more susceptible to CVD and majority of them were males 46.66%. average number of cardiovascular drugs per patients was 5.58. 57.05% of the drugs prescribed were from the Indian 2011 list of essential drugs. Poly-pharmacy was observed in 68.33% (123) prescriptions. The prescription rate of antiplatelet, anticoagulant and fibrinolytics were 22.46% followed by 20.07% of antianginal drugs. The prescribing frequency of antianginal drugs 88.57% during discharge time was more higher. 390 potential drug –drug interactions were screened. Medication adherence were more in male patients 56.12% among the 86.66% of follow up patients.

AIM AND OBJECTIVES

AIM:

- To study the prevalence and drug prescription pattern of cardiovascular disease in a tertiary care hospital.

OBJECTIVES:

- To find out the prevalence of cardiovascular diseases.
- To study the demographic details of cardiac patients.
- To study category of drugs prescribed to cardiovascular diseases.
- To identify the most commonly prescribed drugs for cardiovascular diseases.
- To assess the prescribing habits of Cardiologists.
- To promote rational use of drugs.

METHODOLOGY

Study Site

The study is carried out in outpatient department of cardiology in tertiary care hospital, Erode, Tamil Nadu, India.

Duration of study

The duration of study is 10 months (July 2016 - February 2017).

Study design

It is a retrospective observational study.

Source of Data

- Patient's medication profile.
- Physicians prescribing records.
- Nursing charts.

Parameters for Evaluation

- Gender distribution.
- Average age range of patients.
- Types of cardiovascular diseases found.
- Associated diseased conditions.
- Types of drugs mainly used for CVD.
- Types of other adjuvant drugs used for treatment.

STUDY CRITERIA

Inclusion Criteria

- Any patients visited the cardiology department during study period.
- Patients with other co-morbid conditions.
- Patients in 18 years and above.

Exclusion Criteria

- Patients in other departments of the hospital.
- Pregnant and lactating women.
- Patients below 18 years.
- Surgery patients.

STUDY PROTOCOL

- Designing a data entry form with all details of patients, medication and diagnostic methods.
- Collecting the case histories of the patients from the medical records.
- Analyzing the data's and divides into various categories and concluding it.
- Prescription analysis has to be performed by the help of medical records.

TABLES AND GRAPHS

Table 1. Prevalence of Cardiovascular diseases in study population

Sl. No	Total number of patients visited the hospital during study period	Number of CVD prescriptions during study period (n)	Percentage (%)
1.	5275	500	9.478

Figure 1. Prevalence of Cardiovascular diseases in study population

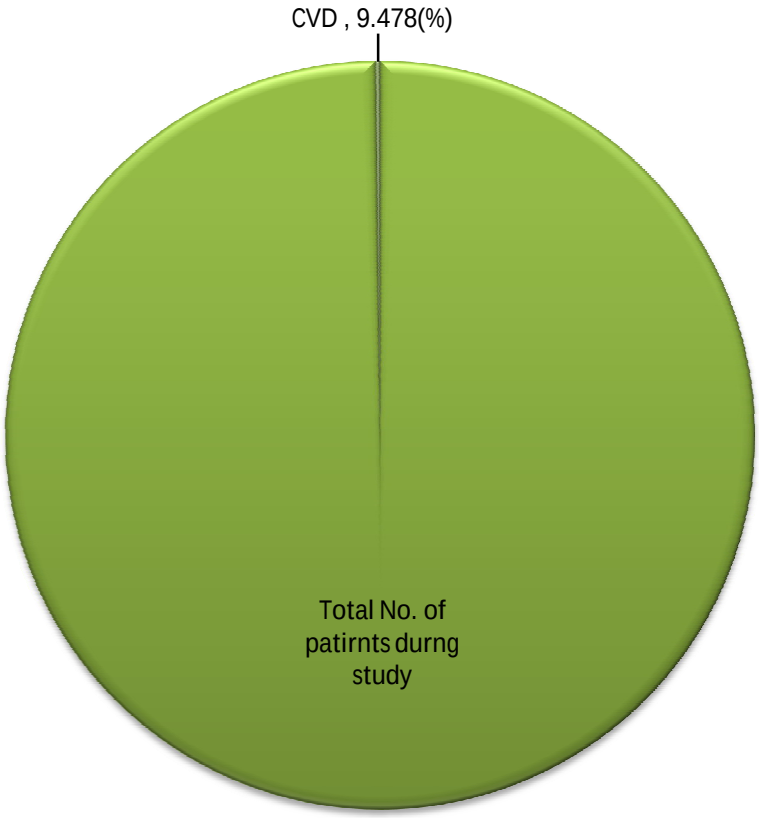


Table 2. Sex wise Distribution of CVD patients

Sl. No	Sex	Number of patients (n=500)	Percentage (%)
1.	Male	301	60.2%
2.	Female	199	39.8%

Figure 2. Sex wise Distribution of CVD patients

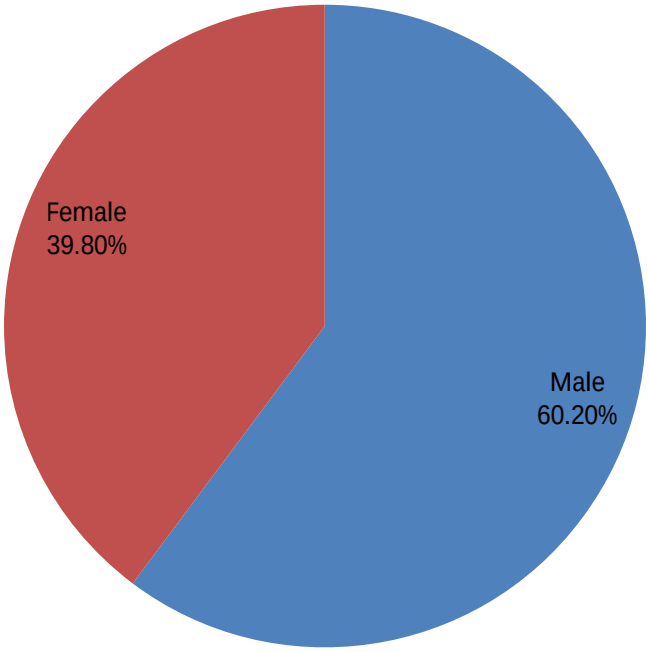


Table 3. Age wise Distribution among CVD patients

Sl. No	Age	Number of patients (n=500)	Percentage (%)
1.	18-20	4	0.8%
2.	21-30	23	4.6%
3.	31-40	46	9.2%
4.	41-50	67	13.4%
5.	51-60	157	31.4%
6.	61-70	115	23%
7.	71-80	68	13.6%
8.	81-90	16	3.2%
9.	90>	4	0.8%

Figure - 3: Age wise Distribution among CVD patients

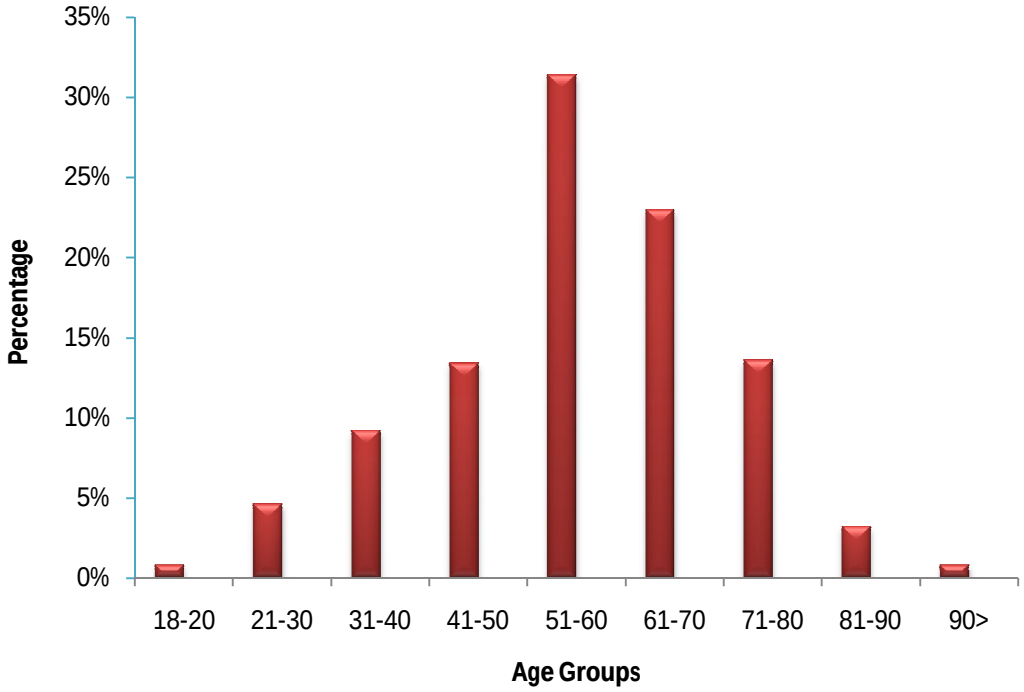


Table 4. Cardiovascular diseases observed in study population

Sl. No	Medical condition	Number of patients (n=871)	Percentage (%)
1.	Hypertention	259	29.73%
2.	Coronary artery disease	173	19.86%
3.	Aortic valve stenosis(mitral valve replacment)	55	6.31%
4.	Cardiac myopathy	57	6.54%
5.	Ischematic heart disease	58	6.65%
6.	Heart failure	52	5.9%
7.	Myocardial infarction	28	3.21%
8.	Dyslipidemia	45	5.16%
9.	Stroke	16	1.83%
10.	Angina	38	4.36%
11.	Rheumatic heart disease	8	0.91%
12.	Arrhythmia	82	9.41%

Figure 4. Cardiovascular diseases observed in study population

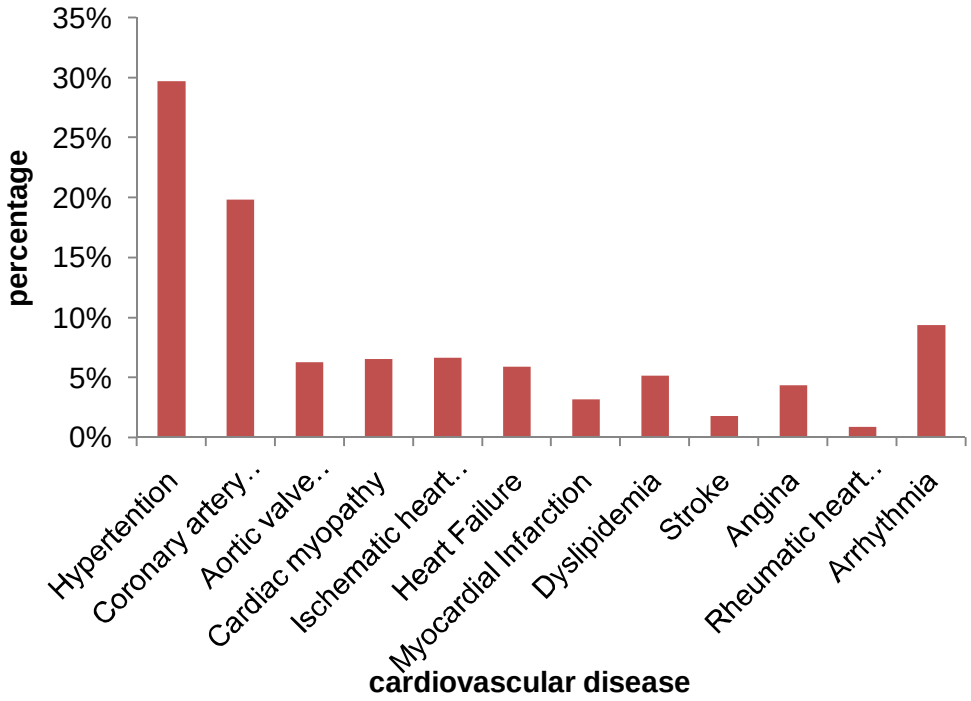


Table 5. Co-morbid diseases

Sl. No	Medical condition	Number of patients (n=500)	Percentage (%)
1.	Diabetes mellitus	180	36%
2.	Anemia	5	1%
3.	Asthma	8	1.6%
4.	COPD	5	1%
5.	Renal disorders	18	3.6%
6.	Thyroid disorders	17	3.4%
7.	GI disorders	11	2.2%
8.	Others	35	7%
9.	None	221	44.2%

Figure 5. Co-morbid diseases

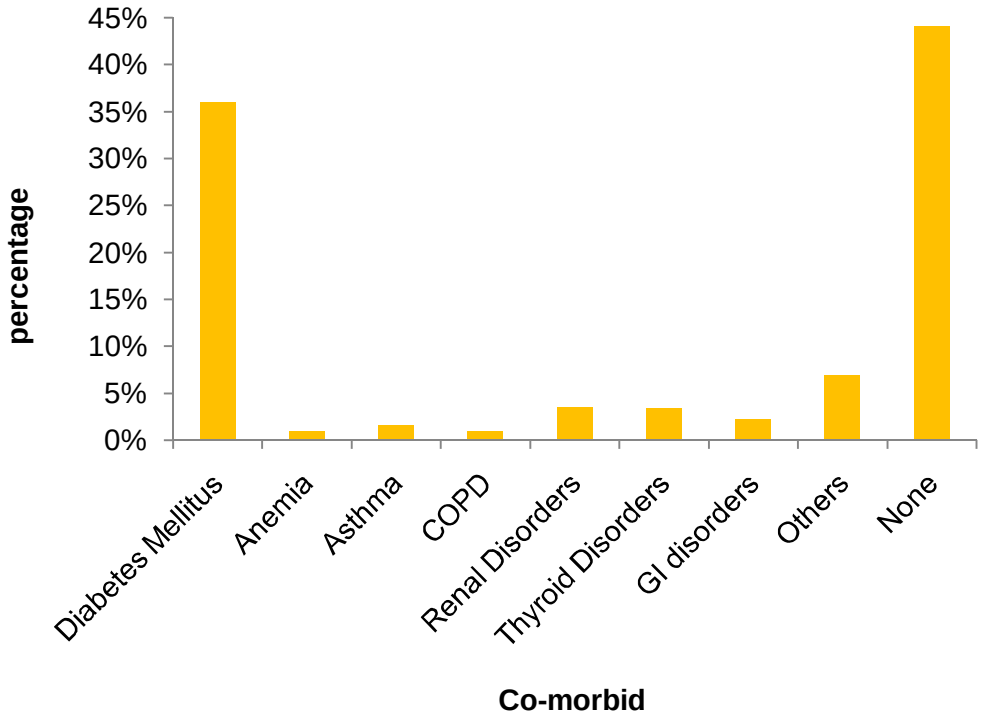


Table 6. Prescribing Pattern of Physicians

Sl.No	Category of drugs	Number of drugs (n=2741)	Percentage (%)
1.	Lipid lowering agents	326	11.89%
2.	Antiplatelets	460	16.78%
3.	Anticoagulants	82	2.99%
4.	Antianginal	301	10.98%
5.	ACE Inhibitors	162	5.91%
6.	ARB	141	5.14%
7.	Alpha Adrenergic blockers	3	0.10%
8.	Beta Adrenergic blockers	149	5.43%
9.	Beta, Alpha Adrenergic receptor blockers	238	8.68%
10.	Calcium Channel blockers	116	4.23%
11.	Anti Arrhythmia	9	0.32%
12.	Anti Heart Faliure	17	0.62%
13.	Vasodilators	16	0.58%
14.	Diuretics	269	9.81%
15.	Antiulcers	150	5.47%
16.	Antidiabetics	133	4.85%
17.	Others	184	6.73%

Figure 6. Prescribing Pattern of Physicians

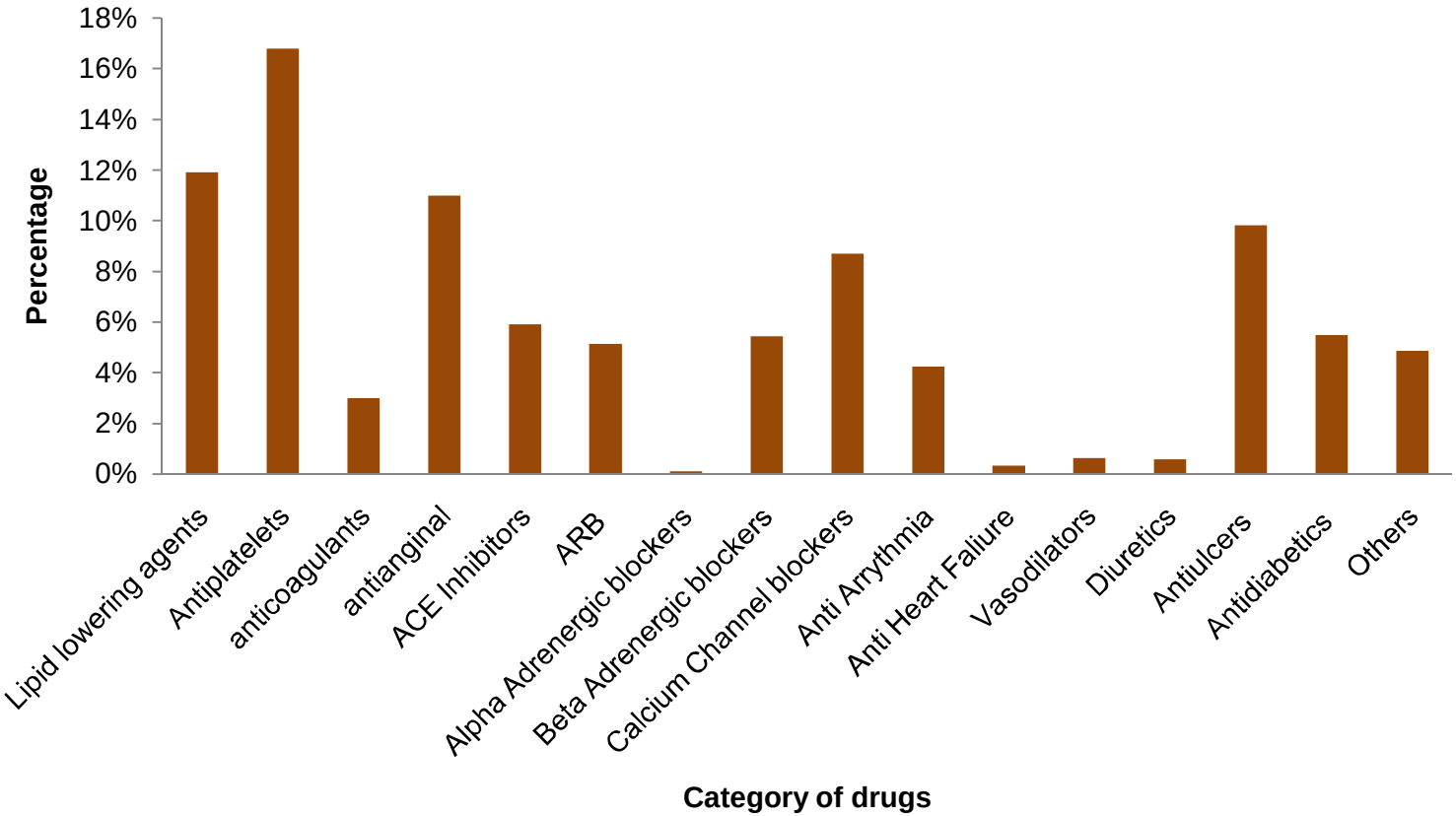


Table 7. Lipid Lowering Agents

Sl.No	Lipid lowering agents	Number of drugs (n=326)	Percentage (%)
1.	Atorvastatin	325	99.69%
2.	Fenofibrate	1	0.30%

Figure 7. Lipid Lowering Agents

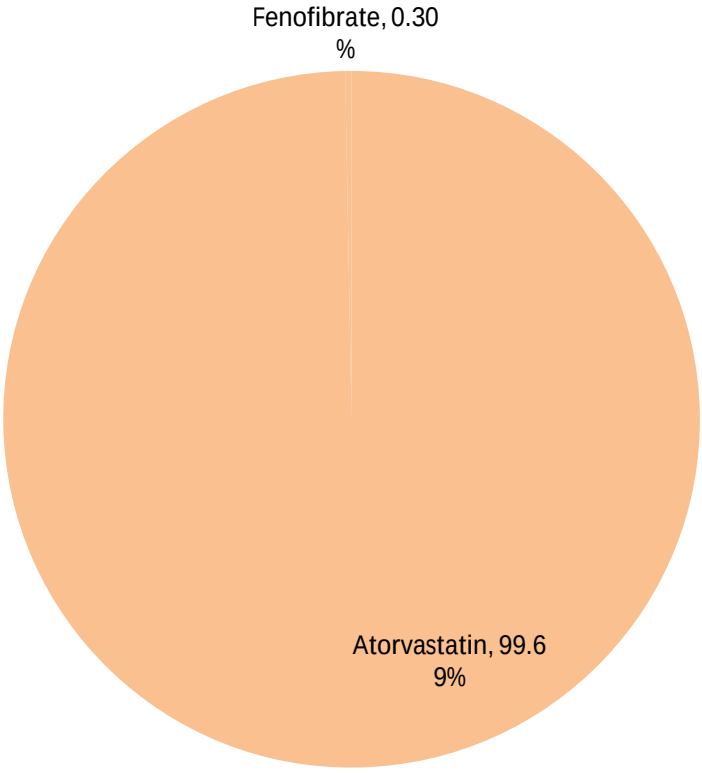


Table 8. Anti-platelets

Sl. No	Anti- platelets	Number of druds (n=460)	Percentage (%)
1.	Aspirin	329	71.52
2.	Clopidogrel	131	28.47

Figure 8. Anti-platelets

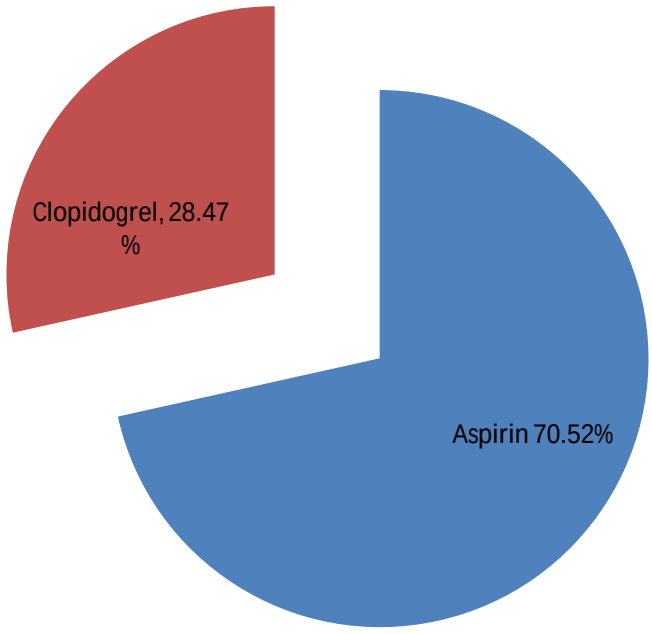


Table 9. Anticoagulants

Sl. No	Anticoagulants	Number of drugs (n=82)	Percentage (%)
1.	Warfarin	42	51.21%
2.	Heparin	23	28.04%
3.	Riaroxaban	17	20.73%

Figure 9. Anticoagulants

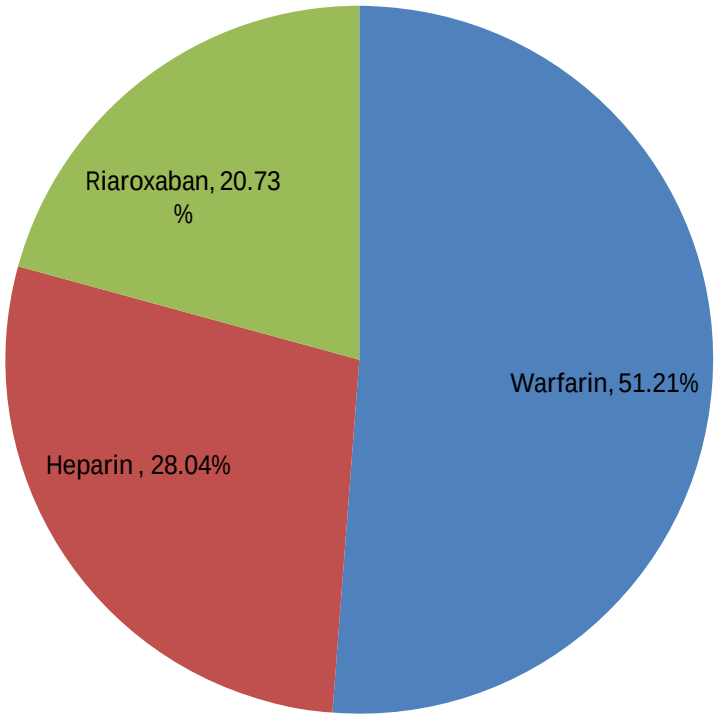


Table 10. Angiotensin Converting Enzyme Inhibitors (ACE-I)

Sl. No.	ACE Inhibitors	Number of drugs (n=162)	Percentage (%)
1.	Lisinopril	157	96.91%
2.	Captopril	3	1.85%
3.	Enalapril	2	1.23%

Figure 10. Angiotensin Converting Enzyme Inhibitors (ACE-I)

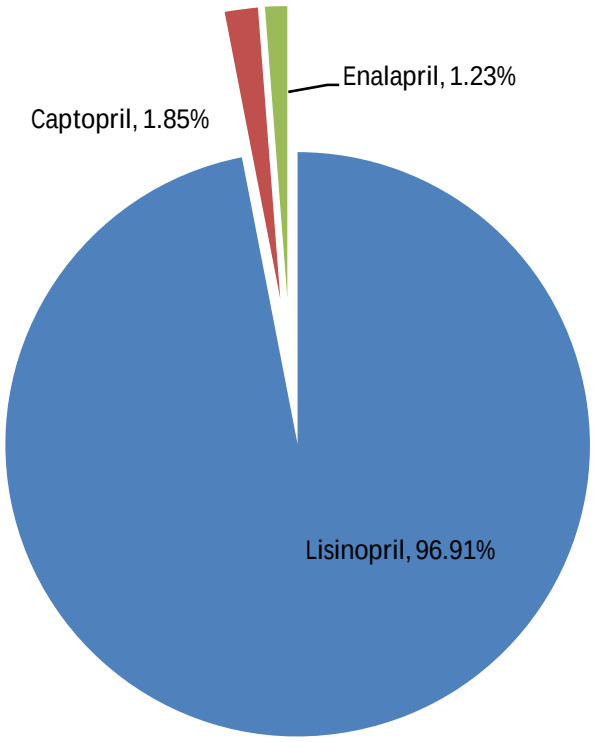


Table 11. Anti-anginal Drugs

Sl. No	Anti-anginal	Number of drugs (n=301)	Percentage (%)
1.	Isosorbid dinitrate	91	30.23%
2.	Nitroglycerin	155	51.49%
3.	Ivabradine	53	17.60%
4.	Trimetazidine	2	0.66%

Figure 11. Anti-anginal Drugs

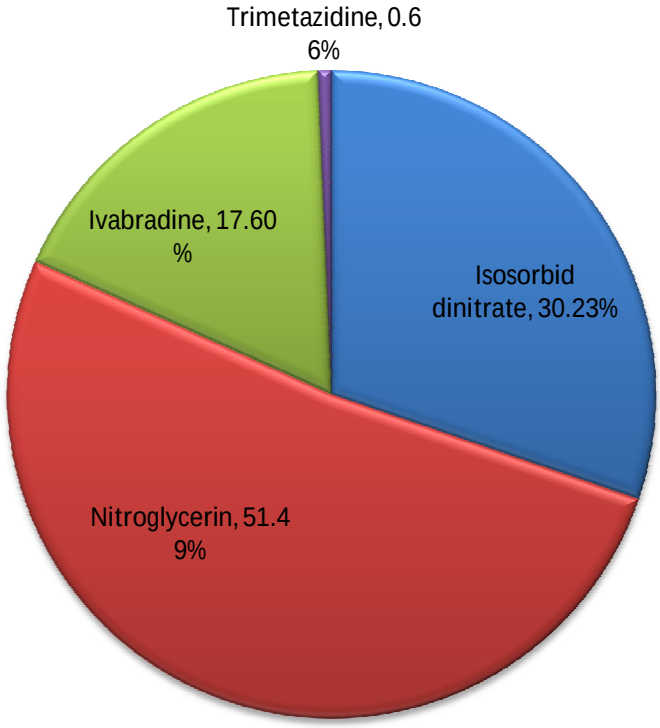


Table 12. Alpha Adrenergic Receptors

Sl. No	Alpha Adrenergic receptors	Number of drugs (n=3)	Percentage (%)
1.	Prazocin	1	33.33%
2.	Tamsulosin	2	66.66%

Figure 12. Alpha Adrenergic Receptors

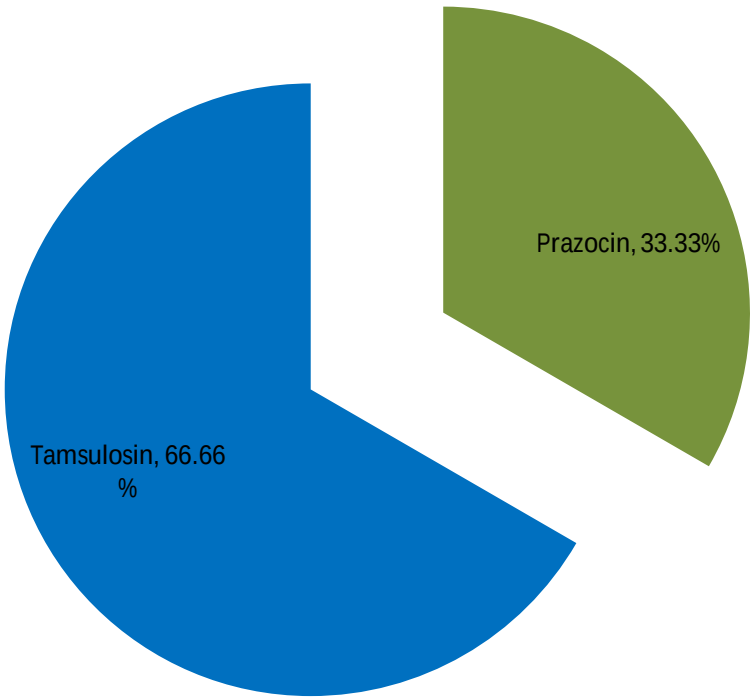


Table 13. Beta Adrenergic Blockers

Sl. No	Beta Adrenergic Blockers	Number of drugs (n=387)	Percentage (%)
1.	Carvedilol	238	61.49%
2.	Atenolol	137	35.40%
3.	Propranolol	11	2.84%
4.	Sotalol	1	0.25%

Figure 13. Beta Adrenergic Blockers

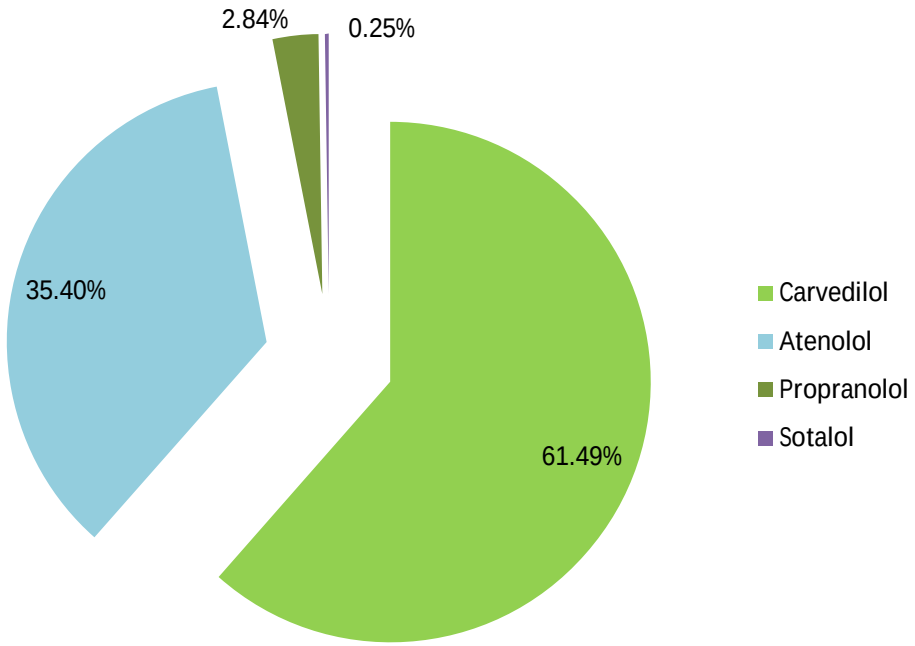


Table 14. Calcium Channel Blockers

Sl. No	Calcium channel blockers	Number of drugs (n=116)	Percentage (%)
1.	Amlodipine	105	90.51%
2.	Diltiazem	7	6.03%
3.	Verapamil	4	3.44%

Figure 14. Calcium Channel Blockers

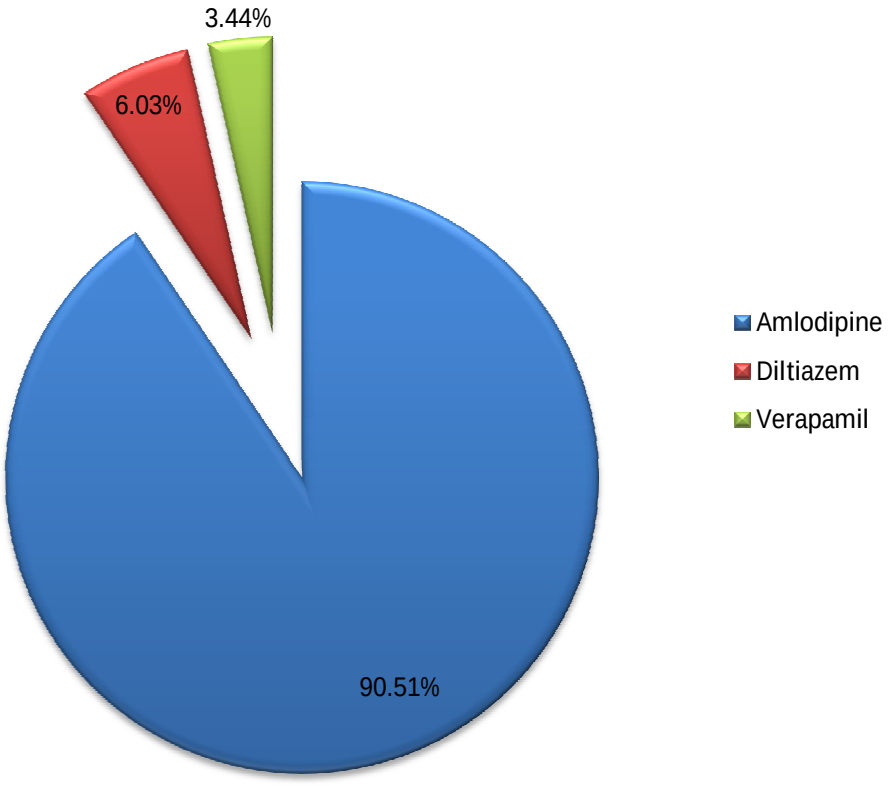


Table 15. Anti-arrhythmic Drugs

Sl. No	Anti-arrhythmia	Number of drugs (n=9)	Percentage (%)
1.	Amiodarone	3	33.33%
2.	Flecainide	6	66.66%

Figure15. Anti-arrhythmic Drugs

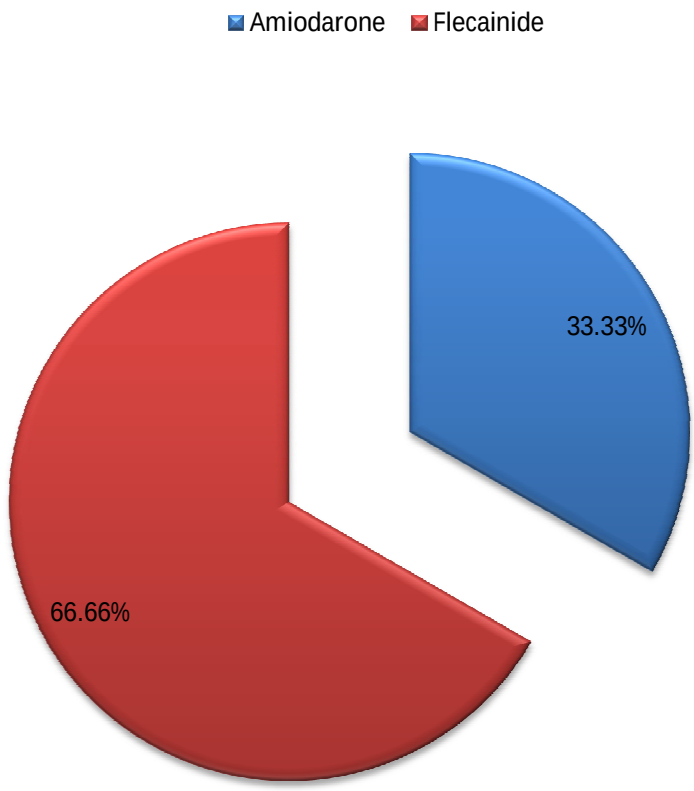


Table 16. Anti-Heart Failure Drugs

Sl. No	Anti Heart Faliure	Number of drugs (n=17)	Percentage (%)
1.	Digoxin	15	88.23%
2.	Dopamaine	1	5.88%
3.	Dobutamaine	1	5.88%

Figure -16: Anti-Heart Failure Drugs

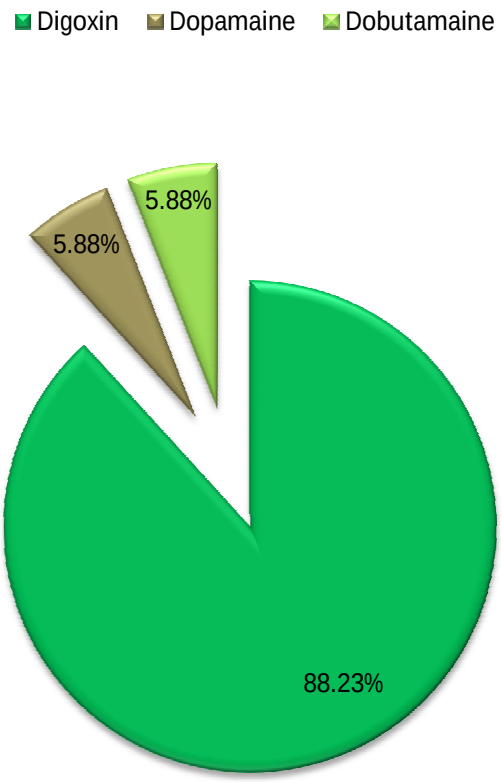


Table 17. Diuretics

Sl. No	Diuretics	Number of drugs (n=269)	Percentage (%)
1.	Furosemide	143	53.15%
2.	Spironolactone	113	42%
3.	Hydrochlorothiazide	12	4.46%
4.	Mannitol	1	0.37%

Figure 17. Diuretics

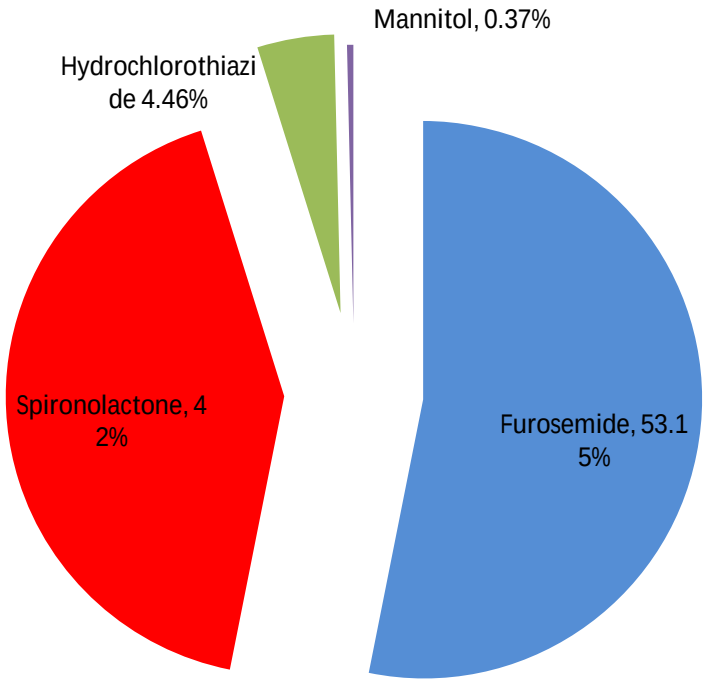


Table 18. Anti- Ulcer Drugs

Sl. No	Anti Ulcers	Number of drugs (n=154)	Percentage (%)
1.	Omeprazole	114	74.02%
2.	Ranitidine	36	23.37%
3.	Antacid suspension	4	2.59%

Figure 18. Anti- Ulcer Drugs

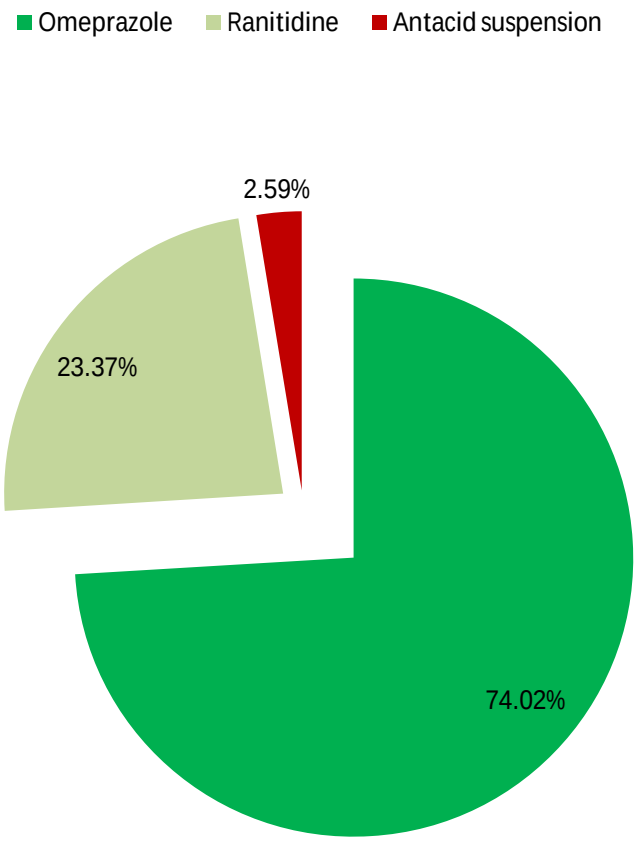
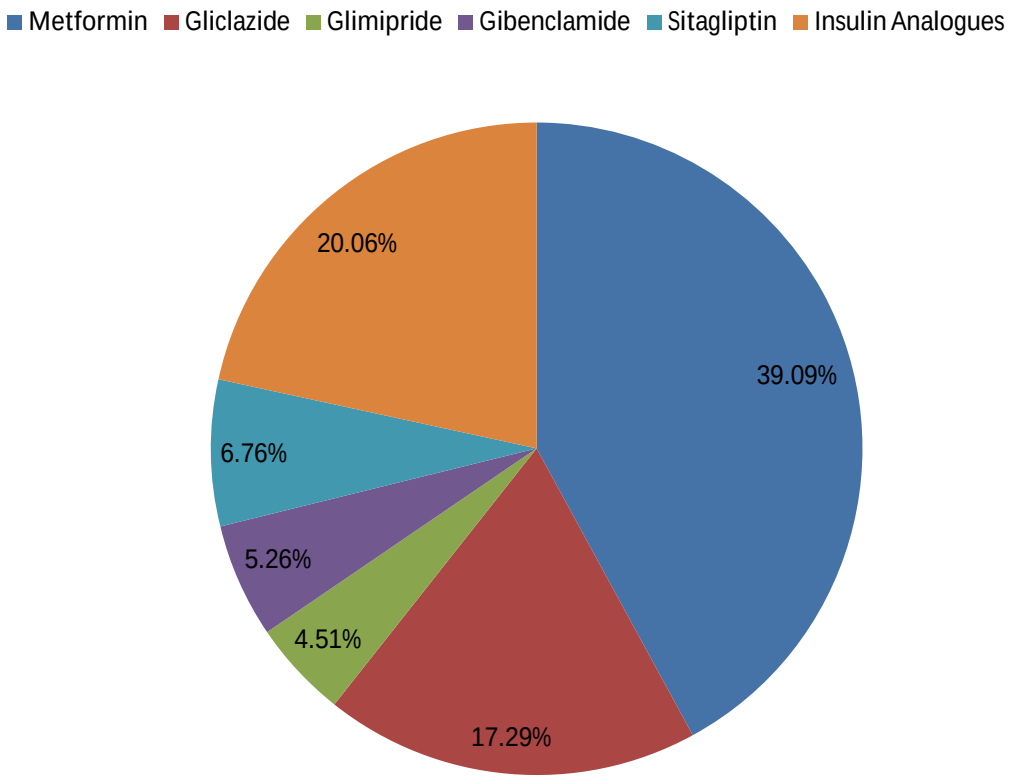


Table – 19: Anti Diabetes

Sl. No	Anti Diabetics	Number of drugs (n=133)	Percentage (%)
1.	Metformin	52	39.09%
2.	Gliclazide	23	17.29%
3.	Glimipride	6	4.51%
4.	Gibenclamide	7	5.26%
5.	Sitagliptin	9	6.76%
6.	Insulin Analogues	36	20.06%

Figure -19: Anti Diabetes



RESULTS AND DISCUSSION

The cross sectional study was conducted on a tertiary care hospital in a time period of 10 months (July 2016 – February 2017). The study is mainly observing the prevalence, prescribing pattern and the method of treatment used for the treatment of several cardiovascular diseases. The patients from other hospital departments or below 18 years, pregnant and lactating women are excluded from this study. The patients who diagnosed with any CVDs other than the above categories are selected for the study.

The study mainly observed the patients data like age, sex, previous and current medical profile and the various class of treatments and its important in the treatment. The data were obtained from patients profile medical records.

During the study period around 5275 patients visited the hospital. From that 500 were diagnosed as cardiovascular disease patients so, the prevalence of cardiovascular disease was found to be 9.478%.

In this study a total of 500 patients were selected by the inclusion and exclusion criteria. Out of the 500 patients selected 301 (60.2%) patients were male and the remaining 199 (39.8%) patients were female. The patients were divided in different age groups: between18-20 years (0.8%), 21-30 years (4.6%), 31-40 years (9.2%), 41-50 years (13.4%), 51-60 years (31.4%), 61-70 years (23%), 51-80 years (13.6%), 81-90 years (3.2%) and >90 years (0.8%).

In this study most of the patients came under the category of male than female, it may be due to their daily activities, smoking and alcoholic habits. In a study conducted by Md. Abdul Muhit et al. for CVD prevalence and prescription patterns observed that most of the patients were male than female.

Cardiovascular diseases may affect any age of the life but by increasing the age the chance for CVD is also increased. In this study the maximum number of patients comes under the age 51-60 years followed by 61-70 years of old. That is complied with the previous report of drug utilization evaluation of CVD that the common age group of CVD observed as 40-60 years. [74]

Extensive diagnosis made by the physician's revealed different clinical conditions prevailing among the patients. Definitely, 29.73% of patients were reported to have hypertension whereas 19.86% of patients were diagnosed with coronary artery disease. Almost 9.41% of CVD patients were reported with arrhythmia. Ischemic heart disease was reported in 6.65% of patients, cardiac myopathy in 6.54% of patients, while 6.31% of patients were reported with aortic valve stenosis and 5.9% of patients were diagnosed with heart failure. In addition, 5.16% of CVD patients were reported with dyslipidemia, 4.36% of patients were diagnosed with angina, 3.21% of patients were reported with myocardial infarction, 1.83% of CVD patients were reported with stroke and 0.91% of patients were reported with rheumatic heart disease.

About half of the population was suffering from hypertension, which increase the risk of coronary heart disease. One study revealed that hypertension is the second leading cardiovascular disease, which is the major cause of other diseases such as heart failure, stroke, myocardial infarction and angina pectoris.[80] Other population based studies suggest that elevated insulin levels, which often occurs in type II diabetes mellitus, is an independent risk factor and co-exist with cardiovascular disease. Other cardiovascular risk factors in diabetic individuals include abnormalities of lipid metabolism, platelet function, and clotting factors.[81]

The physicians also diagnosed several different medical conditions in the patients. For example, 36% of CVD patients were diabetic patients. Around 3.6% of patients were suffering from renal disorders, 3.4% of patients thyroid disorders. Other associated medical conditions included gastro intestinal disorders (2.2%), asthma (1.6%), COPD (1%), anemia (1%), plus many others.

The possibility of cardiovascular diseases in old patients is more than the younger, so associated diseases like diabetes mellitus, renal disorders, thyroid disorders, anemia, asthma, COPD and GI disorders. In this study the maximum number of associated diseases reported was diabetes mellitus. In a study conducted by Mukesh Kumar et al. for CVD prevalence and drug utilization patterns reported that diabetes, anemia and asthma were the co-morbidities associated with CVDs.

Physicians prescribed several and different pharmacological therapeutic classes of drugs. These drugs prescribed to the patients in different groups have been categorized. Most of the patients were advised to take anti-platelets (17.37%) followed by lipid lowering agents (12.31%), anti-anginal drugs (11.36%) and anticoagulants (3.09%). Several anti-hypertensive drugs were prescribed to the patients such as beta adrenoreceptor blockers (8.98%), ACE inhibitors (6.11%), angiotensin receptor blockers (5.32%), calcium channel blockers (4.38%), alpha adrenergic blockers (0.11%), and diuretics (1.01%). The physicians prescribed 5.66% of anti-ulcer drugs for the patients with or without ulcers.

Among the lipid lowering agents, atorvastatin was given to the most of the patients (99.69%). Aspirin and clopidogrel were given to (71.52%) and (28.47%) of patients respectively for reducing clotting for obtaining synergistic anti-platelet effect of the both compounds. Warfarin, heparin and rivaroxaban were prescribed to only (51.21%), (28.04%) and (20.73%) patients, respectively.

Anti-angina agents such as vasodilators were used commonly. Nitroglycerin was prescribed in 51.49% of patients whereas isosorbide dinitrate were prescribed in 30.23% of patients. Ivabradine was prescribed in 17.60% of patients for those who cannot take beta blockers.

Anti-hypertensive agents are predominantly used among the patients. The most preferred options were beta blockers, ACE inhibitors and diuretics. Adrenergic receptor blockers are given to the patients with hypertension. Most of the physicians prescribed carvedilol (61.49%) and atenolol(35.40%). On the other hand some physicians prescribed propranolol (2.84%) and sotalol (0.25%). ACE inhibitors had a great chance in the prescriptions. Lisinopril was given to the most of the patients (96.91%). Diuretics were the third preferred option by the physicians, Furosemide (53.15%) and spironolactone (42%).

The drugs that were mostly prescribed by the specialist doctors (cardiologist and heart specialist) will add value for the general practitioners. The study reveals that most of the patients with lipid profile disorders should take lipid lowering agents. To circumvent this, physicians prescribed worlds mostly prescribed and vended drug namely atorvastatin. It decreases the blood LDL cholesterol level

effectively with increasing the HDL level. It also reduces the risk of coronary artery disease, myocardial infarction and stroke effectively with fewer side effects.[82]

The patients with coronary artery disease were treated with anti-atherogenic agents to prevent clotting at the coronary vessels that may be fatal to them ultimately. This type of narrowing blood vessels may cause of sudden myocardial infarction or stroke. In order to prevent this, physician prescribed clopidogrel and aspirin. Nitroglycerine was the preferred option for the relief of stable and unstable angina. It dilates the blood vessels and supply adequate oxygen to the heart within few minute. Nitrates were the second choice for this purpose.

Beta adrenergic receptors include a class of cardiovascular drugs, which are used for hypertension. Cardio-protective and anti-hypertensive effects of this class of drugs justify much larger use as observed in this study. Beta blockers reduce mortality rate when for primary and secondary prevention of myocardial infarction and chronic heart insufficiency.[83],[84] Carvredilol and atenolol were the mostly prescribed drugs in this study. It's followed by ACE inhibitors and diuretics. This could be explained by widening of indications for their use in hypertension, diabetic nephropathy, heart failure, etc. in the last decade ACE inhibitors become almost the most important drugs in cardiology, taking into consideration their cardio-protective and reno-protective effects. Many clinical studies confirmed reduction in morbidity and mortality in patients with acute myocardial infarction and congestive heart failure with the use of ACE inhibitors.[84]

Thiazide diuretics are fundamentals of anti-hypertensive therapy whereas loop diuretics or high ceiling diuretics are used as potent anti-hypertensive agents when used alone. Combination of furosemide and spironolactone were prescribed in order to overcome the side effects (viz. severe hypertension) of the former one. Diuretics are recommended as initial mono-therapy in older patients with stage I or II of hypertension, or in combination with severe hypertension.

CONCLUSION

The study concluded that most of the patients included in the study were suffering from hypertension and coronary artery disease. These may be due to their food habits, smoking, less exercise and poor health hygiene.

The prescribing pattern was rational and it follows the standard treatment guidelines so, the treatment was effective because of recovery of normal life of patient.

The maximum number of patients was male; it may be due to smoking and alcoholic habits.

Analysis divulges that statins and anti-atherogenic agents are dominant cardiovascular drugs when compared to others. Beta blockers, ACE inhibitors, diuretics are predominant in anti-hypertensive group.

The study has some restrains which leads to say it cannot be a standard one because it is carried out in one tertiary level hospital, may not accord with the data to other generalized hospitals. Beside that the sample size does not reflect the actual population and prescription pattern in the whole state or country.

Under use of calcium channel blockers and angiotensin receptor blockers should be changed by undertaking educative interventions to change the prescribing practice.

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DATA ENTRY FORM

CASE NO:

PATIENT DETAILS:

Name	**:**	**IP no**	**:**
Age	**:**	**Dept**	**:**
Sex	**:**	**DOA**	**:**
Wt	**:**	**DOD**	**:**
Ward	**:**		

REASON FOR ADMISSION:

PAST MEDICAL HISTORY;

PAST MEDICATION HISTORY:

SOCIAL HISTORY:

PHYSICAL EXAMINATION & VITAL SIGNS:

LABORATORY INVESTIGATION:

DIAGNOSIS:

TREATMENT CHART

SI. NO	Generic Name	Trade Name	Dose	Frequency	Date							
1.												
2.												
3.												
4.												
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14.												
15												

NAME OF THE STUDENT :

CASE COLLECTED ON :

SIGNATURE OF STAFF :